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UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF CALIFORNIA, FRESNO DIVISION

NATURAL RESOURCES DEFENSE COUNCIL, CALIFORNIA TROUT, BAYKEEPER AND ITS DELTAKEEPER CHAPTER, FRIENDS OF THE RIVER, and THE BAY INSTITUTE, all non-profit organizations,

Plaintiffs,

v.

DIRK KEMPTHORNE in his official capacity as Secretary of the Interior; and STEVEN A. WILLIAMS, in his official capacity as Director, U.S. Fish and Wildlife Service,

Defendants.

STATE WATER CONTRACTORS,

Defendant in Intervention.

Case No. 1:05-CV-01207 OWW LJO

SUPPLEMENTAL DECLARATION OF CHARLES H. HANSON, PH.D. IN SUPPORT OF STATE WATER CONTRACTORS' REPLY TO PLAINTIFFS' PROPOSED REMEDIES

Date: August 21, 2007
Time: 9:00 a.m.
Courtroom: 3

Judge: Honorable Oliver W. Wanger

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I, Charles H. Hanson, declare as follows:

1. I am a principal in the firm Hanson Environmental, Inc., located at 132 Cottage Lane, Walnut Creek, California. I have Bachelor of Science and Master of Science degrees in fisheries biology from the University of Washington, and a Ph.D. in Ecology and Fisheries Biology from the University of California at Davis. A copy of my professional qualifications was submitted previously as Exhibit 1 to the Declaration of Charles H. Hanson, Ph.D. in support of Intervenors' Joint Motion to Stay (Doc. 293).

2. I am familiar with the interim remedy proposals of the California Department of Water Resources (DWR), and of those of the Federal Defendants in these proceedings, including the Delta Smelt Action Matrix for Water Year 2008 (Matrix) described in the declaration of Jerry Johns in support of the California Department of Water Resources Interim Remedy Proposal, dated July 9, 2007 and the declaration of Cay Collette Goude, dated July 3, 2007. I am familiar with the proposed actions outlined in the declarations of Drs. Tina Swanson and Peter Moyle, dated July 23, 2007, submitted in these proceedings. I am also familiar with the fishery monitoring programs being conducted in the Delta to monitor the status and distribution of various fish species, including delta smelt, each year.

3. In the following sections of this supplemental declaration I will describe (1) information on the approach, data, and results of recent estimates of the population abundance of delta smelt inhabiting the Sacramento-San Joaquin Delta, (2) technical concerns regarding the proposed actions recommended by Dr. Tina Swanson and the foundation for such recommendations, and (3) responses to the list of issues to be addressed in evidentiary hearings on remedy actions outlined by the Court in its Order dated August 1, 2007.

I. DELTA SMELT POPULATION ESTIMATES

4. The California Department of Fish and Game (CDFG) samples the estuarine fish community inhabiting the Sacramento-San Joaquin Delta year-round using a variety of sampling techniques. The two primary long-term fishery surveys conducted by CDFG include the Summer Townet survey and Fall Mid-Water Trawl survey, both of which were originally designed to

provide information on the status of striped bass. The sampling locations and size of nets used in these two surveys were not targeted to the collection of delta smelt; however, incidental collections of delta smelt have provided valuable and important information about the status of the delta smelt population. Additional surveys have been added in recent years including the CDFG 20 mm delta smelt survey and the spring Kodiak trawl survey, which were both specifically designed to provide information on the density and geographic distribution of early juvenile delta smelt (20 mm survey) and pre-spawning adult delta smelt (Kodiak trawl).

5. Results of CDFG fishery surveys have shown that the abundance of delta smelt has declined in recent years. Although survey results show a decline from previous abundance levels, the indices of abundance show that the delta smelt population has remained at stable, although low, levels over the past several years. For example, the CDFG summer townet abundance indices have been 0.3, 0.4, and 0.4 in 2005, 2006, and 2007, respectively. Similarly, the fall mid-water trawl indices of abundance have been 74, 27, and 41 in 2004, 2005, and 2006 (the 2007 survey has not yet been conducted), respectively. The level of protection for delta smelt proposed under the Action Matrix and its refinements during the interim period of implementation has been designed to be greater than in recent years. These protective measures are intended to increase the habitat conditions for delta smelt and reduce the potential for salvage mortality resulting from SWP and CVP export operations.

6. Despite the uncertainties inherent in the CDFG fishery sampling program in providing representative estimates of actual delta smelt densities and their distribution within the Delta, there has been a desire to estimate the actual population abundance of various lifestages of delta smelt as part of evaluating the relative importance of export-related mortality to the delta smelt population as a whole, understanding mortality rates and population dynamics from one life-history stage to another, and assessing the overall population status and viability of delta smelt inhabiting the estuary as part of the Endangered Species Act (ESA) recovery planning (Miller 2005; Bennett 2005). Herbold (1996) discusses some of the problems, uncertainties, and assumptions that make it difficult to estimate delta smelt population abundance. In my July 23, 2007 declaration, I presented the results of estimates of the abundance of early juvenile lifestages

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of delta smelt based upon the 2007 CDFG 20 mm survey data and briefly discussed factors affecting the reliability of the resulting population abundance estimates. In developing the delta smelt population abundance estimates I provided in my earlier declaration, several fundamental assumptions were made, including the assumption that the density of delta smelt sampled by CDFG at a specific location is representative of a uniform density of fish throughout the water column and throughout a specified region of the Delta. I also made no correction to the original CDFG density estimates to account for size-selective gear efficiency.

7. Since the sampling equipment utilized by CDFG in these fishery surveys is not completely effective in retaining all delta smelt collected, the resulting density estimates, which have not been corrected in my calculations for size-specific gear collection efficiency, are considered to be an underestimate of the actual density of delta smelt inhabiting the system. For example, CDFG conducted an experimental test to evaluate the collection efficiency of the standard midwater trawl net during August 1991 and again in January 1992. Their gear collection efficiency study was conducted by using the standard fall midwater trawl net (12.7 mm mesh) which was then encased in a much smaller mesh net (3.2 mm mesh), in order to provide an estimate of the numbers of delta smelt passing through the standard fall midwater trawl net and subsequently not being accounted for in the calculation of delta smelt densities. Results of these experimental tests showed that the standard midwater trawl net was only approximately 30% effective in retaining delta smelt during the August investigation and was approximately 55% effective in retaining delta smelt during the January investigation (Sweetnam and Stevens 1993). The difference in collection efficiency between the August and January investigations was attributed to the increase in delta smelt length resulting in subsequently greater gear collection efficiency for larger delta smelt. Other investigators including Sitts (2007) have also included relationships for size-specific gear collection efficiency for each of the various sampling techniques employed by CDFG.

8. My estimate of population abundance also assumed that delta smelt are uniformly distributed throughout a region of the Delta (both vertically within the water column as well as laterally across the channel). Although detailed studies have not been conducted that provide

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fine-grained resolution of the vertical and lateral distribution of delta smelt at various life-history stages, anecdotal information is available from broodstock collections of delta smelt conducted by researchers from the University of California, Davis. As part of the delta smelt culture program, UCD investigators have been collecting delta smelt for use as a broodstock. The broodstock sampling is conducted using a purse seine, which samples relatively shallow waters within the area of the Delta where delta smelt are expected to be most abundant. In past years, the UCD researchers have been able to collect several thousand delta smelt per year in only a few days of sampling at a small number of locations. As explained in the accompanying declaration of Dr. Richard Sitts, 2,418 pre-spawning adult delta smelt were captured and removed from the Delta by UCD researchers in 2006. This compares to CDFG sampling during the fall, which typically collects tens to hundreds of delta smelt despite sampling monthly over a four-month period at a large number of locations throughout the Delta. These results, although not quantitative, indicate that delta smelt are not uniformly distributed throughout the Delta and that delta smelt densities in some areas are higher than those sampled in the routine CDFG fishery surveys.

9. All of the investigators who have been working on developing quantitative population estimates for delta smelt within the estuary recognize and acknowledge these limitations. For example, Bennett (2005) developed population abundance estimates for various life-history stages of delta smelt based upon results of the CDFG fishery surveys. Bennett utilized analytical methods and assumptions similar to those used in my calculations of the delta smelt population abundance in 2007. Bennett (2005) estimated delta smelt abundance based on both the CDFG Summer Townet and Fall Mid-Water Trawl surveys by assuming that the densities represented in the CDFG fishery surveys were representative of the delta smelt density within a larger region of the estuary. He also made no corrections to account for size-specific sampling efficiency. Bennett's methods and results have been published in the San Francisco Estuary and Watershed Science Journal (Volume 3, Issue 2 - September 2005) showing that delta smelt abundance during both the summer and fall surveys has been highly variable over the past several decades (Exhibit 1). Bennett has also shown significant correlations between his estimates of delta smelt abundance from the various surveys and the corresponding abundance

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indices as classically derived by CDFG (Exhibit 2). The population abundance estimates derived by Bennett (2005) for early juvenile delta smelt (using the 20 mm survey data) ranged from approximately 1.5 to 8 million early juvenile delta smelt over a range of years. The population abundance estimate that I derived based on the CDFG 2007 20 mm surveys (surveys eight and nine) ranged up to approximately 1.8 million juveniles (survey 9), which is generally within the range of early juvenile delta smelt population estimates derived by Bennett (2005). The estimates of early juvenile delta smelt population abundance that I derived from the 2007 CDFG 20 mm survey (survey 9) were also generally consistent with results of similar population abundance estimates derived by Sitts that showed estimates of early juvenile delta smelt population abundance of approximately one million individuals based on preliminary estimates from Survey 9. The general convergence of these population estimates developed by several independent investigators supports the assumption that although there are uncertainties and potential biases inherent in the data and the assumptions required for estimating delta smelt population abundance, the general approach represents the best available information on the current status of the delta smelt population inhabiting the estuary.

10. The population abundance estimates presented in my July 23, 2007 declaration were derived using data collected from the CDFG 20 mm survey during early July. Since the preparation of my earlier declaration, CDFG has completed the first three Summer Townet surveys of 2007. I used data from the third (latest data available on the CDFG web site) 2007 Summer Townet survey to estimate average delta smelt densities within the various regions of the estuary and to derive the most current estimates of delta smelt population abundance for this year. The results of the Summer Townet survey provide a juvenile delta smelt population abundance estimate, based on survey data collected between July 7 and 14, 2007, of 680,000 delta smelt. Sitts has also developed preliminary estimates estimating juvenile delta smelt population abundance based on the Summer Townet survey of approximately 630,000 juvenile delta smelt. See Declaration of Richard Sitts PhD, dated August 13, 2007. For comparative purposes, the estimated salvage of juvenile delta smelt during the spring and early summer 2007 at the SWP and CVP export facilities has been approximately 2,700 fish (see paragraph 25). Assuming that

approximately 15-20% of these juveniles would have survived to become pre-spawning adults by December the potential loss of these juveniles to salvage (assuming 100% salvage loss) would represent approximately 400 to 540 pre-spawning adults. These estimates of the current juvenile delta smelt population abundance inhabiting the estuary provide an important context for evaluating the potential effects of SWP and CVP fish salvage on the overall population abundance of delta smelt.

11. The decline in the estimates of delta smelt abundance between my earlier calculations using the CDFG 20 mm survey data (survey 9) and the estimates calculated using the summer townet data (survey 3) is not unexpected. Juvenile delta smelt experience mortality throughout the late spring and summer months encompassed by these surveys. Delta smelt are subject to predation mortality by fish and birds, losses resulting from entrainment at a variety of diversions located throughout the Delta, potential exposure to contaminants, and from natural causes associated with food availability and other factors. Typically the highest levels of mortality occur in the early life-stages of delta smelt (e.g., larvae and early juveniles) with decreasing levels of natural mortality, as the fish grow larger and mature into adults. In addition, the sampling nets used by CDFG have a size-selective bias in the retention of delta smelt and other species. As the size of delta smelt increases over the period sampled by the 20 mm survey the ability of the net to effectively retain smelt also increases. When CDFG changes the sampling nets to the summer townet survey the smaller smelt present during the early periods of the sampling are not retained at the same level of efficiency as larger fish collected later in the sampling period. Size-selectivity of the sampling nets is one of the factors that affect the reliability of the fishery sampling program in estimating population abundance. Based on the rates of mortality observed in the previous delta smelt surveys I have estimated that the 680,000 juvenile delta smelt abundance estimate from the most recent summer townet survey would result in an adult population later this fall (December 1 when the protective actions discussed in my earlier declaration would be started) of approximately 100,000 to 135,000 (assuming survival rates from mid-July to the end of November within the range from approximately 15 to 20%) pre-spawning adult delta smelt. Sitts produced a similar estimate of the projected pre-spawning

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population of delta smelt, based on the juvenile population abundance estimates from the latest CDFG summer townet survey, of 95,122 pre-spawning adult smelt. see Declaration of Dr. Richard Sitts dated August 13, 2007. The projected loss of approximately 500 pre-spawning adult smelt as a result of salvage during the spring-early summer 2007 represents approximately 0.5% of the projected pre-spawning delta smelt population estimated from these analyses.

12. At several locations within her Declaration Dr. Swanson presents a comparison of the number of delta smelt collected in sampling by CDFG and the numbers of delta smelt reported from the SWP and CVP fish salvage. For example on pages 15-16, lines 27-28 and 1-2 Dr. Swanson reports "throughout this period, water temperatures remain below 25 C and nearly 500 delta smelt were killed at the SWP and CVP water export facilities, compared (emphasis added) to the fewer than 50 delta smelt that had been collected by CDFG in more than two months of sampling to that date". Later in her declaration on page 16, lines 22-25 Dr. Swanson reports "between May 1 and July 19, 2007, 2,648 juvenile delta smelt have been reported killed in the SWP and CVP water export facilities compared to a total of 136 delta smelt collected in the CDFG 20mm survey during more than three months of sampling (7/17/07 DAT teleconference summary, attached as Exhibit X)". These statements by Dr. Swanson are apparently intended to imply that the numbers of delta smelt salvaged by the SWP and CVP export facilities are substantial when compared to the numbers of smelt in the population as reflected by the numbers collected in the CDFG fisheries sampling program. Although Dr. Swanson compares the results of two very different events; viz., CDFG fisheries sampling and SWP and CVP fish salvage, the text of her declaration implies that the level of effort (e.g., volume of water sampled) is comparable between the CDFG fisheries sampling and water project salvage operations. Although we were unable to obtain the detailed data on the actual volume of water sampled during each of the 20 mm fisheries surveys conducted during 2007, data are available for a comparable set of CDFG 20 mm fisheries surveys conducted during 2005. During both 2007 and 2005 a total of nine 20 mm delta smelt surveys were conducted by CDFG. During the 2005 20 mm fisheries surveys a total of 1,080 samples were collected, representing an estimated water volume sampled of 132 acre-feet. During the period encompassed by the surveys reported by Dr.

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Swanson (May 1 – July 19, 2007), delta smelt salvage estimates for the SWP and CVP export facilities were based on an extrapolated water volume diverted of 647,611 acre-feet – almost 5,000 times the volume of water sampled in the CDFG fishery surveys.

13. Given the wide disparity in sample volumes between the SWP and CVP salvage operations on the one hand, and sample volumes in the CDFG 20 mm delta smelt surveys on the other, the numbers of delta smelt collected through these two different programs cannot be directly compared. The comparisons presented in Dr. Swanson's declaration, in the absence of a disclosure of the large discrepancy in water volumes represented by Project salvage operations and CDFG fisheries sampling, produce an inaccurate and misleading conclusion.

II. FOUNDATION FOR REMEDIES

14. Dr. Swanson relies on results of a preliminary, unpublished analysis developed by Pete Smith (USGS) of the relationship between Old and Middle River flows during January and February and delta smelt salvage at the SWP ands CVP export facilities (Figure 8, page 12 in the declaration of Dr. Swanson). In her description of the relationship, Dr. Swanson reports that delta smelt take increases linearly with increasing magnitude of negative flow in Old and Middle rivers. Dr. Swanson, however, fails to acknowledge that two of the important data points included in the analysis by Pete Smith assumed that there would be no delta smelt salvage when combined Old and Middle river flows are 0 cfs, rather than using the actual delta smelt salvage data from the SWP and CVP export facilities. Furthermore, the relationship presented by Dr. Swanson includes delta smelt salvage data only through 2004 and has not been updated in her declaration to include any of the more recent data on the potential relationship between delta smelt salvage during the winter months and reverse flows in Old and Middle river. In addition, Dr. Swanson fails to disclose that more recent analyses prepared by the California Department of Water Resources (DWR) show that the relationship between delta smelt salvage during the winter months and Old and Middle river reverse flow is not a linear response. Instead, it shows a clearly defined threshold in which delta smelt salvage appears to be independent of Old and Middle river reverse flows (Exhibits B and C to the Declaration of Jerry Johns filed July 9, 2007). The

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relationships depicted in the Exhibits presented by Mr. Johns show little or no connection between Old and Middle river reverse flows and delta smelt salvage up to a threshold of approximately -6,000 cfs. Above that flow, delta smelt salvage increases substantially as the magnitude of Old and Middle river flow increases. In developing the recommended magnitude of reverse flows presented as part of her proposed interim measures, Dr. Swanson relied upon the earlier linear relationship in establishing recommended Old and Middle river reverse flow conditions (e.g., -3,500 cfs as reported on page 24, line 17). Management recommendations based on the earlier linear regression analysis, presented originally by Pete Smith, provide an inappropriate and outdated foundation for establishing proposed interim management actions. Furthermore, as with other findings presented in Dr. Swanson's declaration, there is no disclosure or discussion of alternative data analyses or their results that should be considered when weighing and evaluating potential interim management actions.

15. Dr. Swanson also proposes an interim action to improve habitat quality for delta smelt during the fall by requiring sufficient outflow to maintain low-salinity habitat between the confluence of the Sacramento and San Joaquin river systems (i.e., X_2 downstream of 80 km) beginning in September and continuing through December (Swanson Action # 10). Dr. Swanson reports that maintaining X_2 at or downstream of 80 km is identical to protections proposed in the Pelagic Fish Action Plan (Exhibit Q to Dr. Swanson's declaration), except for the fact that the Pelagic Fish Action Plan proposes to maintain it (action plan) for the entire May-December period, rather than the shorter September-December period outlined in Action 10 (see pages 29-30, lines 25-28 and 1-3 of her declaration). In reviewing Dr. Swanson's declaration, she provides no analysis or technical basis in support of maintaining the proposed interim action over the September-December period.

16. Although Dr. Swanson relies on the Pelagic Fish Action Plan as part of her support for the proposed interim action, she fails to disclose that the Pelagic Fish Action Plan includes an exemption from the proposed action in below normal and dry water years (Pelagic Fish Action Plan, page 47; Exhibit 3). The exemption included in the Pelagic Fish Action Plan was specifically intended to avoid the potential adverse impacts of maintaining low-salinity habitat

during the fall and early winter in those years when hydrologic conditions are relatively dry and the water supply impact associated with the proposed action would potentially result in depletion of upstream reservoir storage and associated cold water pools, as a result of the need for increased releases to maintain the low-salinity X_2 downstream of 80 km. Depletion of the coldwater pools in upstream reservoirs has the potential to adversely impact river water temperatures supporting the life-stages of a number of important salmonid species. These include winter-run, spring-run, fall-run and late fall-run Chinook salmon adult migration, holding, spawning and egg incubation, or juvenile rearing, as well as adult migration and juvenile rearing by Central Valley steelhead inhabiting Central Valley river systems downstream of major storage impoundments that would potentially be affected by the proposed interim action. The interim action presented in Dr. Swanson's declaration is proposed to be implemented beginning in September 2007, despite the fact that 2007 has been identified by DWR as a dry water-year type.

17. Results of preliminary hydrologic water modeling of Dr. Swanson's proposed interim action # 10 have identified a significant potential risk that upstream reservoir storage and coldwater pool depletion may occur as a result of implementation of increased releases during the fall and early winter months to support low-salinity habitat within the Delta in 2007 (Terry Erlewine pers. comm.) As noted below, the Resource Agency authors of the Pelagic Fish Action Plan (March 2007) also recognized the potential for depleting coldwater storage as a result of implementing an X_2 standard during the summer and fall during dry hydrologic periods. Coldwater pool depletion increases the potential risk of adverse impacts to Chinook salmon and steelhead protected under the California and/or federal Endangered Species Acts, as well as other resident and migratory fish species inhabiting the Central Valley river systems. Currently Shasta Reservoir storage is less than the desired level of storage identified in the National Marine Fisheries Service (NMFS) Biological Opinion for protection of winter-run Chinook salmon. In addition, although winter-run Chinook salmon have exhibited increased levels of adult escapement in recent years, results of current spawning surveys suggest that there is a relatively low population abundance of spawning adults returning to the Sacramento River system and spawning in 2007. Dr. Swanson's declaration does not adequately describe nor analyze the

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potential impacts of the various interim actions she proposes on upstream reservoir storage, habitat quality and availability for protected runs of Chinook salmon and steelhead, potential impacts to other fishery and aquatic resources, or other factors that should be taken into consideration in developing a balanced, scientifically-based proposal for interim actions.

18. Dr. Swanson also summarizes the results of analyses developed by the Contra Costa Water District (page 9 of her declaration) that relate juvenile delta smelt abundance, as measured in the CDFG summer townet survey, to electrical conductivity in the delta in the vicinity of Jersey Point during the previous fall and winter. Her summary is based on results of a statistical analysis, presented in Figure 4 of Dr. Swanson's declaration (page 9), but provides very little analysis or insight into the biological basis for the hypothesized relationship. Two potential factors are hypothesized by Dr. Swanson as contributing to the observed statistical relationship presented in her Figure 4. These are: (1) changes in the salinity distribution within the estuary during the fall and associated changes in habitat quality or availability for delta smelt and/or (2) the change in fall salinity has provided habitat conditions favorable to the geographic expansion of the distribution and abundance of the overbite clam (*Corbula*), which is thought to compete with delta smelt for planktonic food and nutrients. However, Dr. Swanson provides no analysis or basis to support either of these potential hypotheses.

19. Information from CDFG fisheries sampling provides insight into the salinity tolerance of sub-adult and adult delta smelt, as do results of laboratory tolerance studies. Results of these investigations show that the range of electrical conductivities reported at Jersey Point in the analysis presented in Figure 4 of Dr. Swanson's declaration are within the range that would be considered to be suitable habitat for juvenile and adult delta smelt during the fall and winter (URS Corporation and Jack R. Benjamin Associates 2007). Furthermore, neither sampling nor analyses appear to be available that support the hypothesis that higher salinity levels within the Delta during the fall and winter period promote an expansion of the geographic distribution of the overbite clam or contribute to an increased effect of clam biomass on food availability for delta smelt and other estuarine organisms. There are two species of clam that have been introduced into the Bay-Delta estuary that are dominant components of the benthic macroinvertebrate

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community. These are the overbite clam *Corbula*, which inhabits more brackish waters, and the more freshwater clam *Corbicula*. Both of these clam species occur within the Delta in relatively high abundance. Therefore, a shift in the geographic distribution of salinity gradients during the fall and winter period has the potential to affect the species composition of clams inhabiting a specific location, but may or may not affect the overall biomass of benthic filter feeders that would affect abundance of phytoplankton, zooplankton and nutrients that would otherwise provide a forage base for delta smelt.

20. Statistical analyses, such as those presented in Figure 4 of Dr. Swanson's declaration, have generated a number of alternative hypotheses regarding the potential mechanism underlying the relationships (e.g., altered food supplies, changes in habitat conditions, changes in species competition and predation, etc.) that warrant further investigation. Feyrer *et al.* (2007) examined long-term records of environmental conditions within the Delta and potential statistical relationships with indices of delta smelt abundance at various life stages. Feyrer *et al.* (2007) reported that in addition to fall salinity, other water quality variables such as Secchi depth (a measure of water transparency) improved the statistical stock-recruitment relationships for delta smelt. Based on results of their analyses Feyrer *et al.* (2007) concluded that "Nonetheless, it is questionable whether there are simple ways to use variables such as Secchi depth for species management, at least during the fall period that we studied. Moreover, for water quality data to be most effective for species management, additional information is needed to better define the mechanisms for the effects of water quality variables on aquatic organisms." To date, however, the mechanisms through which these water quality variables potentially affect habitat quality or availability for delta smelt have not been validated. The available scientific information on the importance of factors such as salinity distributions during the fall and early winter period on habitat quality and availability, and subsequent production of delta smelt, requires further investigation before it can be used, with confidence, as the technical foundation for identifying interim management actions. This is particularly true if those actions are accompanied by a high risk of adverse impacts to other listed fish species and aquatic resources.

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III. ISSUES RAISED BY THE COURT

COURT QUESTION NO. 1: The effect of 24 hour pumping on the viability of delta smelt.

21. If the occurrence of delta smelt were substantially greater in the export salvage during either the day or night, one potential export strategy could be selective diversion operations between day and night time to reduce delta smelt salvage. To investigate potential differences in delta smelt collections at the SWP and CVP fish salvage facilities between day (defined as 6 a.m. to 6 p.m.) and night (defined as 6 p.m. to 6 a.m.), I summarized salvage data for collections made during 2003, 2004, 2005, and 2006. The results of these analyses show that the numbers of delta smelt collected during the night is typically greater than delta smelt collections during the daytime. Over the four years of salvage information included in this analysis the total numbers of delta smelt collected during the day and night are shown below:

SWP Salvage	Day (Expanded Number)	Night (Expanded Number)	Difference
2003	8,364	12,823	4,459
2004	5,402	8,292	2,890
2005	978	1,944	966
2006	12	0	-12
Total	14,756	23,059	8,303
CVP Salvage			
2003	9,045	10,533	1,488
2004	3,373	3,396	23
2005	362	468	106
2006	108	204	96
Total	12,888	14,601	1,713

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22. Based upon results of these diel distribution analyses it appears that the numbers of delta smelt collected at night were greater than the numbers collected during the daytime at both the SWP and CVP export facilities. These analyses, however, are based only on the diel distribution of delta smelt collected in export salvage operations and do not account for the potential variation and export rates between the day and night time periods (which have occurred in the past in response to differences in peak and off-peak power costs) that may also have influenced the diel distribution in delta smelt salvage. That was not taken into account in this analysis.

COURT QUESTION NO. 2: The effect of an attenuated pumping schedule on delta smelt.

23. The vulnerability of delta smelt to salvage at the SWP and CVP export facilities is influenced by a wide variety of factors including, but not limited to, the magnitude of SWP and CVP export rates, the geographic distribution of delta smelt within the estuary, salinity and water temperature gradients that influence habitat suitability for delta smelt, hydrodynamics within the estuary including reverse flows in the lower San Joaquin River, flow rates within Old and Middle rivers, the location of the low salinity habitat (X_2), Delta outflow, and other factors. The relationship between delta smelt salvage, exports, and hydrodynamic conditions occurring within various regions of the Delta are not necessarily linear functions (Exhibit 4), but rather may respond to various threshold conditions such as reverse flow in Old and Middle rivers.

24. The effects of attenuating SWP and CVP export operations on the vulnerability and number of delta smelt salvaged at the export facilities is not necessarily a direct proportional relationship to the rate of SWP or CVP exports alone (e.g., reducing export rate by 50% does not necessarily result in a reduction in delta smelt salvage of 50%). The best available information on the relationship between export operations and hydrodynamic conditions within the estuary affecting delta smelt salvage, particularly during the winter and early spring months, as well as results of particle tracking modeling used to evaluate the potential effects of the export operations on the risk and vulnerability of larval and early juvenile delta smelt to export-related losses, was

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used in developing the Delta action matrix proposed by the California Department of Water Resources and US Fish and US Wildlife Service (USFWS) in earlier declarations and were used as the basis for proposed modifications and refinements to the matrix actions included in my July 23, 2007 declaration.

COURT QUESTION NO. 4: Current estimates of the number of delta smelt killed at the SWC and CVP pumps between June 1 and August 20, 2007.

25. Salvage of delta smelt at both the SWP and CVP export facilities is monitored in compliance with the terms and conditions outlined in the USFWS biological opinion for SWP and CVP operations and as part of standard fish salvage monitoring protocols at both export facilities. Results of daily delta smelt salvage are reported on the US Bureau of Reclamation (USBR) mid-Pacific webpage at http://www.usbr.gov/mp/cvo/. Copies of the salvage records reported for June, July, and August (through August 12, 2007) are included in Exhibits 5,6, and 7. The total reported delta smelt salvage (expanded salvage) over the period from June 1 through August 12 is 2,220 delta smelt, which was comprised of 2,148 delta smelt collected in salvage operations at the SWP export facility and 72 delta smelt collected at the CVP export facility.

26. In my July 23, 2007 declaration I reported that delta smelt salvage at the SWP and CVP export facilities during the period from April 1 to June 30, 2007. Dr. Swanson in her declaration reported that delta smelt salvage during the period from May 1 to July 19, 2007 totaled 2,648 fish. Both of these salvage estimates were based on information reported by USBR on SWP and CVP salvage. The difference between the two salvage estimates results, in large part, from the inclusion of later data, extending through July 19, 2007, in the salvage estimates reported by Dr. Swanson.

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COURT QUESTION NO. 5: Whether minimum safe pumping levels, around 850 cfs, results in the killing of delta smelt.

27. Results of salvage monitoring at the SWP and CVP export facilities during May and early June, 2007 provide information on delta smelt salvage during periods when SWP and/or CVP export operations were 850 cfs or less. Results of daily salvage monitoring show that delta smelt were collected in salvage operations at both the SWP and CVP export facilities during periods when exports were 850 cfs or less at each of the two export facilities. Beginning on June 1 and continuing through June 9, 2007 the SWP export was curtailed (zero exports) while the CVP exports continued at a rate of approximately 850 cfs. During this period no delta smelt were reported in the salvage from either the SWP or CVP export facilities.

COURT QUESTION NO. 6: Best current estimate of the entire delta smelt population abundance.

28. As discussed above the best available population abundance estimates for juvenile delta smelt are those derived from the surveys eight and nine of the CDFG 20 mm delta smelt surveys, and the first three 2007 summer townet surveys. The early juvenile delta smelt population abundance estimate that I developed using density data from the survey nine CDFG 20 mm survey was approximately 1.8 million delta smelt. The population estimate that I developed based upon the latest CDFG Summer Townet survey conducted between July 9 and 14, 2007 was 680,000 juvenile delta smelt. Results of the 2007 delta smelt population estimates calculated from the CDFG 20 mm surveys and the summer townet survey 3 are shown in Exhibit 8. As discussed above, the decline in delta smelt abundance during the summer is not unexpected given the mortality that occurs during the early life stages of a species such as delta smelt.

COURT QUESTION NO. 7: The effect of water temperature on the survival of delta smelt.

29. Thermal tolerance studies conducted under controlled laboratory conditions, such

as those described by Dr. Swanson (Swanson *et al.* 2000) provide generalized guidelines for evaluating the potential effects of elevated water temperatures on habitat use by species such as delta smelt. Laboratory thermal tolerance studies, however, are conducted under highly controlled conditions in which the fish does not have the ability to behaviorally respond to thermal conditions. Under natural conditions within the Delta juvenile and adult delta smelt have the ability to behaviorally respond to environmental gradients including both water temperatures and water salinity in determining their geographic distribution and habitat preference. An alternative approach to examining the potential effects of water temperature on habitat preference for delta smelt is based on the actual collection of delta smelt as part of fishery sampling conducted by CDFG over a range of water temperatures. During each fishery collection CDFG records information on surface water temperature, surface water salinity (electrical conductivity), and other parameters used to characterize environmental conditions at each sampling site. Information from the CDFG 20 mm and summer townet surveys was compiled under my direction and control and the total number of delta smelt collected as a function of surface water temperature at the time and location where the samples were made was used as an indicator of the response of early juvenile (20 mm surveys) and juvenile (summer townet survey) delta smelt habitat preference as a function of water temperature within the Delta. Results of these analyses are presented in Exhibit 9.

30. Since the early juvenile delta smelt collected in the 20 mm surveys are sampled during the late spring and early summer, prior to the time of substantially elevated water temperatures occurring within the Delta, it is not surprising that the majority of delta smelt were collected at water temperatures ranging from approximately 15 to 23 C. The geographic distribution of juvenile delta smelt collected in the Summer Townet surveys represents habitat selection by smelt during the warmer summer months. The distribution of delta smelt collected over the 33 year survey period (1973-2005) shows that the majority of delta smelt were collected at water temperatures ranging from approximately 19 to 23 C, although a small number of delta smelt were occasionally collected at water temperatures up to approximately 26 C (Exhibit 9). These results show that the vast majority of juvenile delta smelt were collected in the summer

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townet surveys at locations within the Delta where water temperatures were less than 25 C. Based upon results of these frequency analyses I have concluded that the 25 C temperature criterion provides a reasonable and useful indicator of the potential occurrence of delta smelt within various regions of the Delta during summer months and can be used as a functional trigger for implementing protective actions.

COURT QUESTION NO. 10: The effects on delta smelt of increased pumping levels to 3500 cfs or higher.

31. The potential change in the vulnerability of various lifestages of delta smelt to SWP and CVP export rates of 3,500 cfs or more varies in response to a variety of factors which, as discussed above, include the geographic distribution of delta smelt, hydrodynamics within various regions of the estuary including reverse flows within Old and Middle rivers, and other factors. Exhibit 4 shows the relationship between delta smelt salvage at the SWP and CVP export facilities during January and reverse flows in Old and Middle rivers, which are influenced in large part by the rate of export at the SWP and CVP facilities. The relationship shown in Exhibit 4 suggests that there would be very little, if any, increase in delta smelt salvage during January as export rates and associated reverse flows in Old and Middle rivers increase above 3,500 cfs up to a level of approximately 6,000 cfs. As export rates increase further, resulting in a greater magnitude of reverse flows within Old and Middle rivers, delta smelt salvage would be expected to increase exponentially.

32. If larval and juvenile delta smelt are located downstream within the area of Suisun Bay and Suisun Marsh they are largely outside of the zone potential influence of SWP and CVP export operations, and would have reduced vulnerability to export-related effects. In contrast, if juvenile delta smelt are inhabiting the central Delta in the vicinity of Franks Tract and/or Old and Middle rivers, delta smelt would have an increased risk and vulnerability to export-related effects at export rates less than 3,500 cfs.

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33. The proposed delta smelt action matrix, in combination with the modifications and refinements that I proposed in my July 23, 2007 declaration, take these various factors into consideration when developing a multi-tiered approach to protecting delta smelt that utilizes information on their geographic distribution, hydrodynamic conditions within the estuary, and results of actual export salvage monitoring as a foundation for triggering specific protective measures during the interim remedy phase. Rather than develop entirely prescriptive, rigid operating rules, given the uncertainties and dynamic nature of the interaction between delta smelt distribution, hydrodynamics, and export operations, I decided that the most appropriate framework for protecting delta smelt should be responsive to the actual conditions occurring within the estuary and specific triggering events, and should be constructed in a phased hierarchy of protective actions, that would be immediately implemented on a nondiscretionary basis. I developed a tiered approach to identifying and implementing protective actions to (1) provide protection for delta smelt throughout the year until a long-term biological opinion could be developed and approved; and (2) utilize the best-available scientific information developed from CDFG surveys and other resources for implementing protective actions that, to the extent possible, would also minimize water supply impacts.

COURT QUESTION NO. 13: Whether any adverse impacts to other protected species will be caused by delta smelt mitigation measures.

34. As discussed above, implementing specific actions designed to protect or enhance the delta smelt population and their habitat has the potential to adversely impact other species. Such actions include managing the location of a low salinity (X_2) zone downstream of kilometer 80 as proposed by Dr. Swanson in a dry or critically dry water year. Under current conditions, attempting to do so would require additional freshwater releases from upstream reservoirs. Releasing additional storage from upstream reservoirs such as Shasta Reservoir or Oroville Reservoir to meet an X_2 requirement during the fall and early winter (September - December as proposed by Dr. Swanson) for delta smelt has the potential to exhaust the coldwater pool

available within the reservoirs. This, in turn, will jeopardize the ability of those reservoirs to meet water temperature requirements for adult holding, spawning and egg incubation, and juvenile rearing of protected fish species, such as winter-run and spring-run Chinook salmon or Central Valley steelhead on the mainstem Sacramento River downstream of Shasta Reservoir. Likewise, it would jeopardize the ability of Oroville Reservoir to meet the temperature needs of spring-run Chinook salmon and Central Valley steelhead inhabiting the Feather River. All of these salmonid species are identified for protection under the California and/or federal ESA and would potentially be vulnerable to harm as a result of implementing one or more of the proposed downstream actions.

35. As part of my proposed refinements to the delta smelt Action Matrix, I proposed that reverse flows in the lower San Joaquin River be managed in such a way as to reduce the potential movement of delta smelt into the central Delta. One potential mechanism for reducing the magnitude of water supply impacts associated with managing reverse flows would be to expand the period that the Delta Cross-channel gate, located on the Sacramento River at Walnut Grove, remains open from November through January. Periodic closure of the Delta Cross-channel during the November – January period has been identified as a management action that would improve the survival of downstream migrating juvenile Chinook salmon and steelhead. To help resolve the potential conflict in management objectives regarding Delta Cross-channel gate operations an adaptive management strategy could be implemented during the November – February period while interim remedy actions are in place. This strategy, would retain the Delta Cross-channel gate in its open state as a default operation to help benefit habitat conditions and hydrodynamics for delta smelt, but would provide for the Delta Cross Channel to be closed opportunistically in response to either the results of fishery sampling conducted upstream (e.g., Knights Landing, Red Bluff Diversion Dam, Sacramento River at Sacramento) or when environmental conditions occurring within the Sacramento River and its tributaries are thought to stimulate downstream migration by juvenile salmonids (e.g., increase in flow in response to precipitation and stormwater runoff, increase in turbidity, etc.). The Data Assessment Team (DAT) currently provides the technical framework for identifying management actions, such as

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Delta Cross-channel closures, during the November – January period that, during the interim remedy phase, could be directed to balance competing interests between juvenile salmonids and delta smelt.

COURT QUESTION NO. 14: The reliability of most current data concerning the population and recovery and survival of delta smelt.

36. Several of the long-term fishery monitoring programs designed and implemented by CDFG were originally focused on providing information regarding striped bass. Many of the fishery sampling programs preferentially sample within the main deeper-water channel areas to facilitate collection logistics and therefore do not provide information on the potential occurrence of delta smelt in shallower areas adjacent to shoals or the shoreline. Furthermore, size-specific gear collection efficiency has not been rigorously tested or evaluated for delta smelt and therefore represents an unknown potential bias. In addition, estimates of delta smelt population abundance require information on the uniformity of the delta smelt distribution within various regional areas of the Delta. As discussed above, the current population estimates assume uniform distributions of delta smelt densities. All of these various factors influence, both positively and negatively, the reliability of the current data when estimating delta smelt population abundance, mortality rates, and the overall population dynamics of the species as it relates to both informed management decisions as well as recovery planning. However, a tension exists with respect to modifying existing fishery sampling programs to provide more reliable information on the geographic distribution, densities, and population abundance of delta smelt. The CDFG Summer Townet survey and Fall Mid-Water Trawl surveys represent long-term monitoring programs that have been collecting fishery information for over three decades. If the fundamental design, sampling stations, or sampling methods were to be substantially modified to be more representative of delta smelt, these changes would corrupt the long-term ability of the CDFG fishery surveys to provide comparative information from one year to the next. The value of maintaining long-term fishery monitoring programs within the estuary is high.

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37. In response to concerns regarding the potential biases inherent in the CDFG Summer Townet and Fall Mid-Water Trawl surveys, CDFG has augmented these two long-term survey programs with the CDFG 20 mm delta smelt survey, the spring Kodiak trawl survey, and additional fishery collections conducted during the early spring to assess the density and distribution of larval delta smelt and other fish eggs and larvae to provide more specific information relevant to assessing the habitat conditions and population status for delta smelt. Additional targeted fishery investigations such as experimentally sampling for delta smelt selectively at various water depths (to address the issue of density distribution within the water column), comparative sampling within the main channels and along shoals and channel margins (to address the issue of uniformity of densities within a region), and more extensive tests of the size-selectivity of the various sampling nets in retaining delta smelt (gear collection efficiency), etc. have also been identified that would help provide further information and refinement on population abundance and trends for delta smelt. Manpower constraints, budget constraints, logistics, and concerns regarding the potential impact of fishery monitoring on the delta smelt population have all been factors influencing decisions regarding supplemental fishery sampling targeting delta smelt.

COURT QUESTION NO. 16: Whether migration patterns of delta smelt following June take them out of the risk of SWP and CVP export losses.

38. During the summer months of June, July, August, and September, water temperatures within the central and southern regions of the Delta increase in response to solar radiation. Coincident with the seasonally increasing water temperatures within the central and southern portions of the Delta the delta smelt distribution typically shifts into the lower Sacramento River adjacent to Sherman Island and regions within Suisun Bay and Suisun Marsh. The distribution of delta smelt within the northern part of the Delta, lower Sacramento River, and Suisun Bay during the summer months has the benefit of substantially reducing or eliminating the risk of delta smelt entrainment and salvage at the SWP and CVP export facilities. As part of

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routine fishery sampling CDFG conducts the summer townet survey which, although targeting young-of-the-year striped bass, provides important information on the geographic distribution of delta smelt during the summer months. Results of the most recent CDFG summer townet survey, completed July 14, 2007, shows that delta smelt are distributed within the lower Sacramento River and Suisun Bay, with no delta smelt collected during the summer townet survey within the central or southern region of the Delta (Exhibit 10). Results of the first three 2007 summer townet survey (Exhibits 10, 11, and 12) are consistent with the general trends in the geographic distribution of delta smelt during summer months from CDFG fishery surveys conducted in previous years, as well as results from routine SWP and CVP salvage showing that very few if any delta smelt are reported from either the central and southern Delta or from salvage operations during summer months.

39. As water temperatures begin to cool during the fall months sub-adult delta smelt typically begin an upstream migration prior to spawning. In recent years, many of the sub-adult delta smelt have migrated upstream during the fall and early winter months into the lower Sacramento River in the vicinity of Sherman and Decker islands. As delta smelt move upstream, fish that enter the central or southern Delta would have an increased vulnerability to export effects. Actions are included in the tiered framework of protective actions, including limiting reverse flows in Old and Middle rivers, to reduce the risk of delta smelt salvage in the event that adult delta smelt are found in the central or southern Delta during the winter and/or early spring months.

COURT QUESTION NO. 20: Whether there are other causes that are currently materially contributing to the decline of the delta smelt.

40. The population dynamics of delta smelt are influenced by a variety of factors including, but not limited to, habitat quality and availability, competition for available food supplies and nutrients, predation mortality by native and non-native species, exposure to pollutants and toxicants, entrainment and salvage losses at the SWP and CVP export facilities in

addition to a large number of agricultural, municipal, and industrial water diversions from the Delta, and a variety of other factors. Although much of the discussion during the remedy phase of these proceedings has focused on delta smelt salvage, available scientific information reported by Bennett (2005) and others participating in the pelagic organism decline (POD) investigations have all shown that a variety of factors influence delta smelt population abundance.

41. For example, during the winter and early spring of 2007 water samples collected from the vicinity of Cache Slough and Sherman Island showed evidence of toxicity to macroinvertebrates associated with chemical contaminants such as organophosphates and pyrethroids. A recent study on chemical contaminants within the Bay-Delta estuary produced by the Center for Biological Diversity (Miller 2006) provides information on the application of various pesticides and herbicides within the Sacramento and San Joaquin river and Delta watersheds that potentially affect the Delta aquatic ecosystem through both low-level chronic exposure as well as periodic (episodic) potentially acute exposure to various chemical constituents. During the five year period from 1999 to 2003 Miller (2006) reports that over 43 million pounds of active ingredients in pesticides were reportedly used in the nine Bay Area counties alone. Miller (2006) reported that over 8.6 million pounds of pesticide active ingredient were applied over 2.37 million acres in the Bay Area in 2003 alone. A portion of the estimated 150 million pounds of pesticides applied to crops in the Central Valley each year is transported into the Delta and San Francisco Bay through the Sacramento and San Joaquin rivers (Miller 2006). Pesticide loading from agricultural and urban sources has been identified as one of the factors affecting the aquatic community inhabiting the delta including delta smelt (Bennett 2005; Kuivila and Foe 1995; Kuivila and Moon 2002).

42. Evidence from various studies conducted within the Delta have also shown substantial decreases in the abundance of various zooplankton species and phytoplankton that serve as part of the trophic foundation and food supply for pelagic species such as delta smelt (Sweetnam 1999; Bennett 2005; Kimmerer 2004; Kimmerer *et al.* 1994). Several factors have been hypothesized to affect nutrient loading and primary and secondary production within the Delta including changes in land-use practices, potential effects of pesticide and herbicide

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applications, competition for available food supplies by introduced species such as the overbite clam (*Corbula*) and other non-native species *Corbicula,* threadfin shad, inland silversides, etc. as well as competition between native and non-native zooplankton species. A variety of other macroinvertebrate species as well as fish (e.g., young striped bass and others) also compete for available food supplies within the Delta. The decline in availability of the shallow-water habitat, sub-tidal and tidally inundated wetlands, floodplain habitat, and other habitat features within the estuary have also potentially influenced food availability for delta smelt and other species.

43. CDFG (Herren and Kawasaki 1998) has conducted an inventory of existing water diversions located within the Delta and tributary rivers. Based on results of the inventory CDFG estimated that 2,000 or more individual diversions are located within the Delta and tributaries, the vast majority of which are unscreened, which have the potential for entraining various lifestages of delta smelt. In addition to these primarily agricultural diversions, there are also municipal and industrial water diversions that potentially entrain delta smelt and their food resources. The contribution of these and other diversions to delta smelt population dynamics, food supplies, and habitat quality within the Delta, however, is unknown.

44. The Delta aquatic ecosystem has been extensively modified in the past several decades by not only changes in land-use practices and hydrodynamic conditions but also the introduction of a large number of non-native fish, macroinvertebrates, zooplankton, algae, and other organisms (Bennett 2005; Carlton 1979; Carlton *et al.* 1990). Many of these non-native species compete with delta smelt and other native species for available food supplies and habitat, as well as contributing to increased levels of mortality as a result predation (Nobriga and Feyrer 2007; Bennett 2005). Several studies have been conducted that suggests there have been significant changes in the trophic dynamics of the aquatic community coincident with introductions of species such as the overbite clam (see Bennett 2005 for review). These fundamental changes in the trophic dynamics and aquatic ecosystem occur over a large geographic range and have the potential to significantly affect the population dynamics of pelagic species such as delta smelt, as well as a whole host of other native species inhabiting the Bay-Delta estuary.

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45. Although there are a number of studies currently underway to investigate the potential contribution of these and other factors affecting habitat quality, availability, and the population dynamics of delta smelt, no single causative agent has been identified as being the dominant contributor to the recent observed decline in delta smelt and other pelagic species. Current thinking is that the response of the aquatic community in recent years reflects the cumulative contribution of a variety of independent and interrelated factors that all affect habitat conditions and the population dynamics of various pelagic fish species as well as other aquatic organisms inhabiting the estuary. The cumulative contribution of these various factors, which may change from one year to the next in response to changes and hydrodynamic and hydrologic conditions, changes in point and non-point source contaminants, changes in the abundance and distribution of various native and non-native species, and a variety of other factors all result in a complex and dynamic fabric of interacting factors that affect the status and recovery of species such as delta smelt. Currently there is no consensus within the scientific community regarding the relative contribution of each of these various factors to the cumulative impacts on the Delta aquatic ecosystem and there are currently a variety of planning efforts such as Delta Vision, the Delta Regional Ecosystem Restoration Implementation Plan (DRERIP), and the Bay-Delta Conservation Plan (BDCP) as well as a number of other local and regional planning efforts aimed at providing improvements to the quality and availability of habitat within the Delta to support the aquatic and terrestrial fish and wildlife communities, as well as to support other beneficial uses associated with the Delta including recreational opportunities as well as municipal, agricultural, and industrial water supplies.

46. Evaluating the potential risk that delta smelt population would be in jeopardy of extinction during the interim remedy phase of project operations I considered several important factors which included (1) current estimates of delta smelt abundance are in the range of approximately 700,000 individuals which reduces the risk that a small incremental source of mortality such as that anticipated to occur as a result of SWP and CVP salvage operations under the proposed Action Matrix, and associated refinements and modifications, will result in a significant population-level decrease in delta smelt survival, (2) delta smelt are currently

distributed within areas of the Delta, including the lower Sacramento River and Suisun Bay, where the risk of direct adverse impacts resulting from SWP and CVP export operations are substantially reduced, (3) the tiered protective actions designed to maintain a reduced level of risk for delta smelt during the winter and spring offers progressively increasing levels of protection, through nondiscretionary implementation of various actions, designed specifically to reduce the potential effects of SWP and CVP export operations on delta smelt, and (4) several of the protective measures included in the proposed interim operations are intended to reduce the risk of delta smelt exposure to SWP and CVP export operations through maintaining hydrodynamic conditions within the central and southern portions of the Delta that promote maintenance of the delta smelt distribution within areas of the Delta where their risk is reduced while including the ultimate level of protection through short-term curtailments of export operations in the event that a substantial number of delta smelt are detected through salvage monitoring. Based upon a consideration of these various factors, in combination with a recognition that the interim period of operations is anticipated to have a duration of only 12-18 months before a biological opinion can be developed and approved by USFWS, it is my opinion that the proposed tiered level of protective measures, in combination with the current status of the delta smelt population, will avoid the risk of jeopardy to the species. In addition, I recommend that there be continuing collaborative discussions among state and federal resource agencies and stakeholders regarding further refinements to the proposed tiered framework of protected actions, refinements to fishery monitoring programs to provide increased reliability of information regarding the geographic distribution and population abundance of delta smelt, as well as refinements in the biological data and assumptions used in developing population estimates of delta smelt. Information on the population abundance of delta smelt can subsequently be used to put salvage losses at the SWP and CVP export facilities into a population-level context, used to inform management decisions regarding further refinement of protective measures, and provide important information useful in developing and evaluating recovery actions for delta smelt and conservation strategies designed enhance habitat conditions within the Delta for delta smelt and a variety of other aquatic resources.

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I declare under penalty of perjury that the foregoing is true and correct and that this declaration is executed this 13 day of August, 2007 at Sacramento, California.

CHARLES H. HANSON, Ph.D.

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Literature Cited

Bennett, W. A. 2005. Critical assessment of the delta smelt population in the San Francisco Estuary, California. San Francisco Estuary and Watershed Science 3(2): 1-71.

Carlton, J.T. 1979. Introduced invertebrates of San Francisco Bay. Pages 427- 444 In: San Francisco Bay-The Urbanized Estuary. J.T. Conomos (ed.) Am. Asspc. Adv. Sci. Pacific Division, San Francisco.

Carlton, J.T., J. Thompson, L.E. Schemel, and F.H. Nichols. 1990. Remarkable invasion of San Francisco Bay (California, USA) by the Asian clam *Potamocorbula amurensis* I. Introduction and dispersal. Marine Ecology Progress Series 60 6: 81-94.

Feyrer, F.B., M.L. Nobriga, and T.R. Sommer. 2007. Multi-decadal trends for three declining fish species: habitat patterns and mechanisms in the San Francisco Estuary, California, USA. Canadian Journal of Fisheries and Aquatic Science 64: 723-734.

Herbold, B. 1996. Why we don't do population estimates for delta smelt. IEP Newsletter 8(Spring): 20-22.

Herren, J.R. and S.S. Kawasaki. 1998. Inventory of water diversions in four geographic areas in California's Central Valley. Pages 343-355 In: Contributions to the biology of Central Valley salmonids. Fish Bull. 179 (2).

Kimmerer, W.J. 2004. Open water process in the San Francisco Estuary: from physical forcing to biological control. San Francisco Estuary and Watershed Science 2(1) Article 1.

Kimmerer, W.J., G.E. Gartside, and J.J. Orsi. 1994. Predation by an introduced clam as the likely cause of substantial declines in zooplankton of San Francisco Bay. Marine Ecology Progress

Series 113: 81-93.

Kuivila, K.M. and C.G. Foe. 1995. Concentrations, transport and biological effects of dormant spray pesticides in the San Francisco Estuary, California. Environmental Toxicology and Chemistry 14:1141-1150.

Kuivila, K.M. and G.E. Moon. 2002. Exposure of delta smelt to dissolved pesticides. IEP Newsletter 15 (1): 42-45.

Miller, B.J. 2005. Estimating the population of delta smelt using the spring Kodiak trawl data. Unpublished manuscript.

Miller, J. 2006. Poisoning our imperiled wildlife San Francisco Bay area endangered species at risk from pesticides. A Center for Biological Diversity Report. February 2006.

Norbriga, M.L. and F. Feyrer. 2007. Shallow-water piscivore-prey dynamics in California's Sacramento-San Joaquin Delta. San Francisco Estuary and Watershed Science 5(2) Article 4.

URS Corporation. and Jack R. Benjamin and Associates, Inc. 2007. Technical Memorandum Delta Risk Management Study (DRMS) Phase 1 Topical Area draft ecosystem. Prepared for Department of Water Resources, Sacramento CA.

Resources Agency, California Department of Water Resources, California Department of Fish and Game. 2007. Pelagic Fish Action Plan, March 2007.

Swanson, C., T. Reid, P.S. Young, and J. J. Cech, JR. 2000. Comparative environmental tolerances of threat threatened delta smelt (*Hypomesus transpacificus*) and introduced wakasagi (*H. nipponensis*) in an altered California estuary. Oecologia 123: 384-390.

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Sweetnam, D.A. 1999. Status of delta smelt in the Sacramento-San Joaquin Estuary. California Fish and Game 85: 22-27.

Sweetnam, D.A. and D.E. Stevens. 1993. Report to the Fish and Game Commission: a status review of delta smelt (*Hypomesus transpacificus*) and California. Candidate Species Status Report 93-DS.

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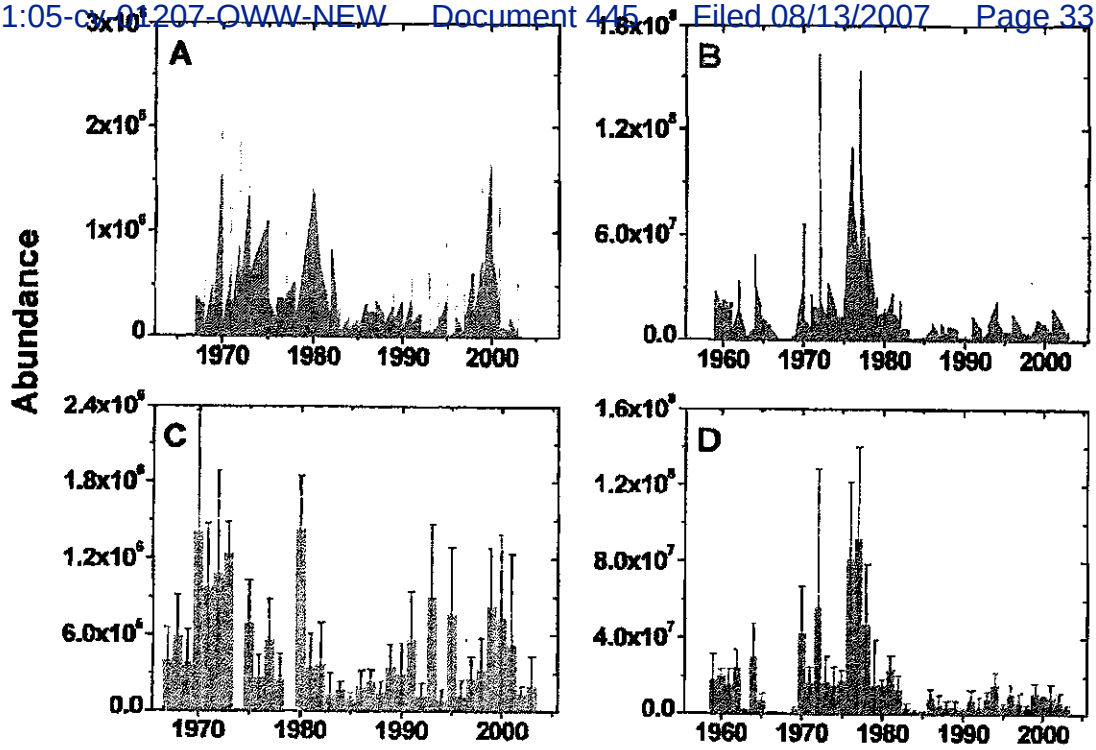


Figure 3. Estimates of abundance derived from catch-per-unit-effort (CPUE) expanded over the volume of the delta smelt habitat for each sampling period in the Fall Midwater Trawl Survey (MWT, A) and Summer Tow-Net Survey (TNS, B). Annual estimates for the MWT (C) and TNS (D) are shown with 95% confidence limits.

Exhibit 1

Source: Bennett (2005)

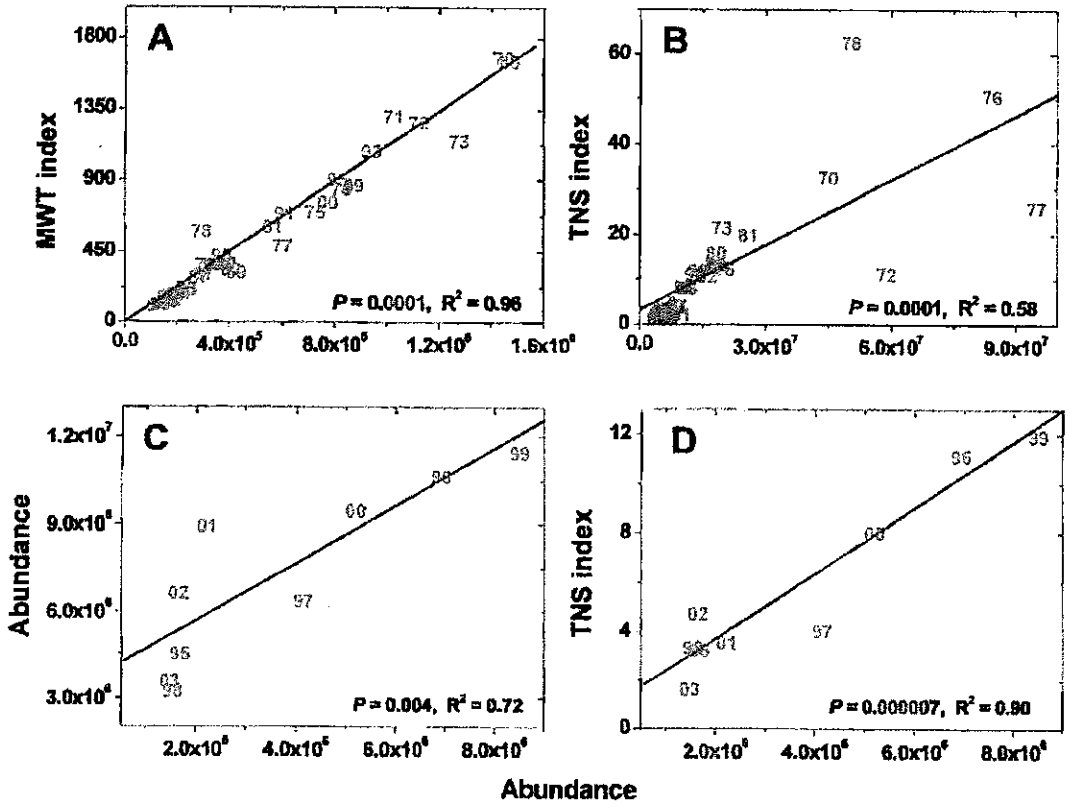


Figure 4. Relationships between the abundance indices and abundance estimates for the Fall Midwater Trawl Survey (MWT, A) and Summer Tow-Net Survey (TNS, B). Relationships are also shown between juvenile abundance estimates (C) and TNS (D) with CPUE in 20-mm (post-larval) Survey. Fitted lines are from linear regressions.

Exhibit 2

Source: Bennett (2005)

Avoiding upstream flow on Old and Middle Rivers once spawning has begun should increase the survival of larvae produced in the southern and central Delta.

The immediate positive effects on survival of delta smelt larvae, until the early summer survey, seems likely. However, a positive effect on age and size composition, or abundance at later life stages, will depend on whether summer food conditions for delta smelt limit smelt population levels. Recent data suggest that summer food levels are limiting delta smelt abundance into the fall, and the increase in delta smelt in the spring and early summer may not translate directly into increased fall population levels of delta smelt.

Cons: This action has a medium-high degree of scientific uncertainty. The barrier at the head of Old River is presently utilized to increase survival of Chinook salmon smolts migrating out of the San Joaquin Basin. The other barriers are used to help maintain water levels in the southern Delta to prevent cavitation of agricultural diversion pumps. Postponement of barrier installation would conflict with these purposes.

Time to Implement: Agreement to implement this action may take some time in order to resolve issues regarding the use of these barriers. This action would be implemented during the 31-day VAMP period starting on or about April 15. The barriers addressing local agricultural diversion would not be fully installed until June 1.

Costs: If this action delays ramping up of exports in late May, there may be some costs associated with the action. The maximum estimated cost for two weeks in May would be about 104 TAF (ranging from 26 to 52 TAF per week), and assumes the VAMP combined export level of 1,500 cfs would continue through May 31.

Maintain X_2 West of Collinsville during May-December (summer/fall)

Increase Delta outflow to maintain an average X_2 position west (seaward) of Broad Slough (80 km) near Collinsville from May through December to increase the amount of delta smelt habitat and shift it downstream. Winter entrainment may be reduced and food availability may be improved.

Through a combination of increased upstream releases and decreased project exports, the X_2 position is maintained seaward of Broad Slough during May-December. This action might be implemented if the current water year type is "above normal" or wetter, which is largely determined by precipitation and runoff in the previous winter and spring. This action would not be considered for implementation if the water year is a "below normal" or drier year because water costs would exceed 1 million acre-feet, and such flows cannot be provided by storage releases without dramatic effects on storage levels and temperature conditions for fish upstream in the fall.

Rationale: Higher Delta outflow in the summer and fall can increase the amount of habitat for delta smelt. If smelt use this habitat and their distribution is wider and shifted downstream, subsequent entrainment in the winter will be reduced.

Exhibit 3

Source: Pelagic Fish Action Plan

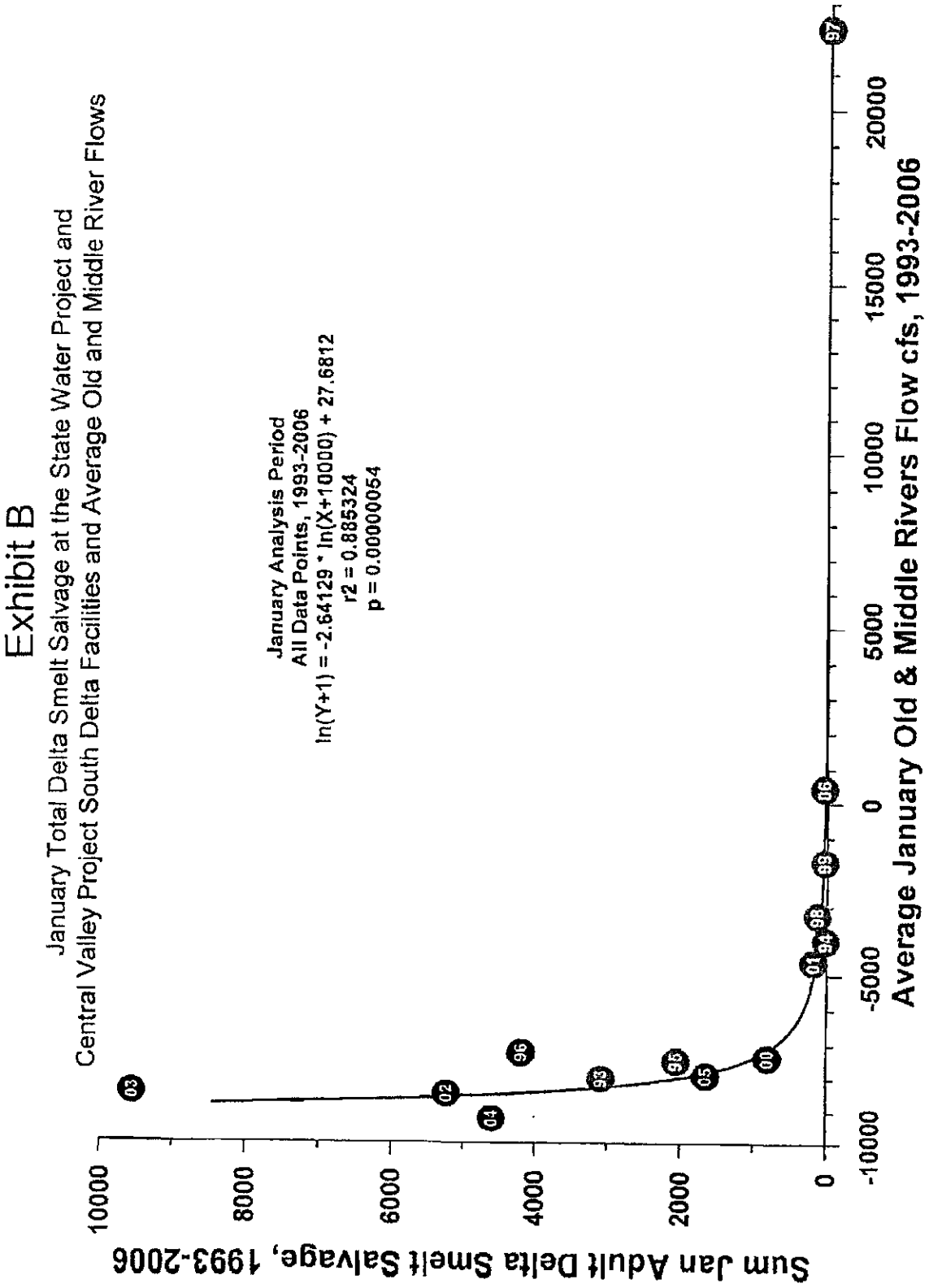


Exhibit B
January Total Delta Smelt Salvage at the State Water Project and
Central Valley Project South Delta Facilities and Average Old and Middle River Flows
January Analysis Period
All Data Points, 1993-2006
ln(Y+1) = -2.64129 * ln(X+10000) + 27.6812
r2 = 0.885324
p = 0.00000054
Sum Jan Adult Delta Smelt Salvage, 1993-2006
10000
8000
6000
4000
2000
0
-10000
-5000
0
5000
10000
15000
20000
Average January Old & Middle Rivers Flow cfs, 1993-2006
Notes: Negative numbers indicate net upstream flow.
Prepared by DWR adapted from analysis performed by USGS.

Exhibit 4

CENTRAL VALLEY OPERATIONS OFFICE

DELTA SMELT AND SPLITTAIL

June-07

Note: Bold numbers are not verified by DFG.

DATE	Daily Total		Combined		Daily Total		Combined		Pumping						Delta Smelt Daily Density	
									Daily Total In CFS			Daily Total In Acre Feet				
	SWP	CVP	Daily Total	14-Day Average	SWP	CVP	Daily Total	14-Day Average	Banks	Tracy	Combined	Banks	Tracy	Combined	SWP	CVP
1-Jun-07	0	0	0	25	0	0	0	9	0	852	852	0	1,689	1,689	#DIV/0!	0.0
2-Jun-07	0	0	0	25	0	0	0	9	0	853	853	0	1,692	1,692	#DIV/0!	0.0
3-Jun-07	0	0	0	25	0	0	0	9	0	854	854	0	1,694	1,694	#DIV/0!	0.0
4-Jun-07	0	0	0	25	0	0	0	9	0	858	858	0	1,702	1,702	#DIV/0!	0.0
5-Jun-07	0	0	0	25	0	24	24	10	0	851	851	0	1,687	1,687	#DIV/0!	0.0
6-Jun-07	0	0	0	23	0	12	12	9	0	850	850	0	1,685	1,685	#DIV/0!	0.0
7-Jun-07	0	0	0	21	0	0	0	9	0	847	847	0	1,680	1,680	#DIV/0!	0.0
8-Jun-07	0	0	0	21	0	0	0	9	0	845	845	0	1,677	1,677	#DIV/0!	0.0
9-Jun-07	0	0	0	18	0	0	0	9	0	849	849	0	1,683	1,683	#DIV/0!	0.0
10-Jun-07	27	0	27	16	0	0	0	5	90	845	935	178	1,677	1,855	151.7	0.0
11-Jun-07	9	0	9	15	0	0	0	3	90	846	937	179	1,679	1,858	50.3	0.0
12-Jun-07	30	0	30	13	0	0	0	3	89	853	941	176	1,691	1,867	170.5	0.0
13-Jun-07	9	48	57	12	0	0	0	3	89	2,009	2,098	177	3,984	4,161	50.8	12.0
14-Jun-07	9	0	9	9	0	12	12	3	90	2,526	2,616	178	5,010	5,188	50.6	0.0
15-Jun-07	18	0	18	11	0	0	0	3	96	2,575	2,671	191	5,107	5,298	94.2	0.0
16-Jun-07	9	0	9	11	0	24	24	5	97	2,575	2,672	192	5,108	5,300	46.9	0.0
17-Jun-07	168	12	180	24	0	60	60	9	495	2,697	3,191	981	5,349	6,330	171.3	2.2
18-Jun-07	90	0	90	31	0	0	0	9	400	2,689	3,088	793	5,333	6,126	113.5	0.0
19-Jun-07	90	0	90	37	2	0	2	8	840	3,363	4,203	1,666	6,671	8,337	54.0	0.0
20-Jun-07	9	0	9	38	0	24	24	9	717	3,754	4,471	1,422	7,447	8,869	6.3	0.0
21-Jun-07	30	0	30	40	0	12	12	10	932	3,525	4,456	1,848	6,991	8,839	16.2	0.0
22-Jun-07	57	0	57	44	0	0	0	10	934	4,017	4,950	1,852	7,967	9,819	0.0	0.0
23-Jun-07	15	0	15	45	0	0	0	10	945	4,278	5,223	1,874	8,486	10,360	8.0	0.0
24-Jun-07	24	0	24	45	0	0	0	10	587	4,211	4,798	1,164	8,352	9,516	20.6	0.0
25-Jun-07	0	0	0	44	0	12	12	10	192	4,279	4,471	381	8,488	8,869	0.0	0.0
26-Jun-07	30	0	30	44	0	12	12	11	324	4,268	4,592	642	8,466	9,108	46.7	0.0
27-Jun-07	327	0	327	63	0	0	0	11	847	4,254	5,101	1,681	8,437	10,118	194.5	0.0
28-Jun-07	30	0	30	65	0	0	0	10	856	4,270	5,125	1,697	8,469	10,166	17.7	0.0
29-Jun-07	78	0	78	69	0	0	0	10	878	4,277	5,156	1,742	8,484	10,226	44.8	0.0
30-Jun-07	390	0	390	96	0	0	0	9	1,360	4,431	5,791	2,698	8,789	11,487	144.6	0.0
Total	1,449	60	1,509	XXXX	2	192	194	XXXX	10,946	74,199	85,145	21,712	147,174	168,886	XXXX	XXXX

Delta Smelt Incidental Take Levels

Below Normal Water Year Type

Delta smelt risk assessment matrix (DSRM) Adult level of concern = 892

Re-consultation level for June = 33,200

EXHIBIT 5

CENTRAL VALLEY OPERATIONS OFFICE

DELTA SMELT AND SPLITTAIL

July-07

Note: Bold numbers are not verified by DFG.

DATE	[redacted]								Pumping						Delta Smelt Daily Density	
	Daily Total		Combined		Daily Total		Combined		Daily Total In CFS			Daily Total In Acre Feet				
	SWP	CVP	Daily Total	14-Day Average	SWP	CVP	Daily Total	14-Day Average	Banks	Tracy	Combined	Banks	Tracy	Combined	SWP	CVP
1-Jul-07	246	12	258	102	2	60	62	9	5,301	3,926	9,228	10,515	7,788	18,303	23.4	1.5
2-Jul-07	311	0	311	118	7	12	19	10	6,032	4,452	10,484	11,965	8,830	20,795	26.0	0.0
3-Jul-07	13	0	13	112	1	0	1	10	5,485	4,442	9,926	10,879	8,810	19,689	1.2	0.0
4-Jul-07	18	0	18	113	11	48	59	13	5,833	4,385	10,218	11,570	8,698	20,268	1.6	0.0
5-Jul-07	21	0	21	112	0	48	48	15	5,301	4,440	9,741	10,514	8,807	19,321	2.0	0.0
6-Jul-07	9	0	9	109	0	24	24	17	5,755	4,358	10,113	11,415	8,644	20,059	0.8	0.0
7-Jul-07	12	0	12	109	36	0	36	20	5,562	4,346	9,909	11,033	8,621	19,654	1.1	0.0
8-Jul-07	6	0	6	107	3	0	3	20	5,459	4,344	9,803	10,828	8,617	19,445	0.6	0.0
9-Jul-07	6	0	6	108	21	0	21	20	5,807	4,354	10,161	11,518	8,636	20,154	0.5	0.0
10-Jul-07	6	0	6	106	0	24	24	21	5,624	4,406	10,031	11,156	8,740	19,896	0.5	0.0
11-Jul-07	0	0	0	83	24	12	36	24	6,200	4,385	10,585	12,298	8,697	20,995	0.0	0.0
12-Jul-07	6	0	6	81	9	0	9	24	6,258	4,386	10,644	12,413	8,699	21,112	0.5	0.0
13-Jul-07	0	0	0	75	6	0	6	25	6,423	4,391	10,815	12,741	8,710	21,451	0.0	0.0
14-Jul-07	6	0	6	48	36	0	36	27	6,985	4,365	11,350	13,855	8,657	22,512	0.4	0.0
15-Jul-07	6	0	6	30	36	12	48	26	7,986	4,354	12,340	15,840	8,636	24,476	0.4	0.0
16-Jul-07	24	0	24	10	6	0	6	26	6,441	4,353	10,794	12,775	8,635	21,410	1.9	0.0
17-Jul-07	6	0	6	9	16	0	16	27	6,878	4,376	11,254	13,642	8,680	22,322	0.4	0.0
18-Jul-07	3	0	3	8	15	12	27	24	7,055	4,382	11,437	13,993	8,692	22,685	0.2	0.0
19-Jul-07	0	0	0	6	36	12	48	24	7,317	4,367	11,684	14,514	8,662	23,176	0.0	0.0
20-Jul-07	0	0	0	6	0	0	0	23	6,930	4,363	11,293	13,746	8,654	22,400	0.0	0.0
21-Jul-07	0	0	0	5	0	12	12	21	6,993	4,391	11,384	13,871	8,710	22,581	0.0	0.0
22-Jul-07	0	0	0	5	0	0	0	21	6,893	4,379	11,271	13,672	8,685	22,357	0.0	0.0
23-Jul-07	0	0	0	4	0	0	0	19	6,681	4,385	11,066	13,252	8,698	21,950	0.0	0.0
24-Jul-07	0	0	0	4	0	12	12	18	6,895	4,418	11,313	13,676	8,763	22,439	0.0	0.0
25-Jul-07	0	0	0	4	0	0	0	16	4,799	4,458	9,256	9,518	8,842	18,360	0.0	0.0
26-Jul-07	0	0	0	3	0	0	0	15	8,024	4,443	12,467	15,916	8,813	24,729	0.0	0.0
27-Jul-07	0	0	0	3	0	0	0	15	7,732	4,467	12,199	15,336	8,860	24,196	0.0	0.0
28-Jul-07	0	0	0	3	12	0	12	13	7,271	4,427	11,698	14,422	8,781	23,203	0.0	0.0
29-Jul-07	0	0	0	2	0	0	0	10	7,144	4,464	11,608	14,170	8,855	23,025	0.0	0.0
30-Jul-07	0	0	0	1	9	0	9	10	6,983	4,434	11,416	13,850	8,794	22,644	0.0	0.0
31-Jul-07	0	0	0	0	0	12	12	9	6,999	4,420	11,420	13,883	8,768	22,651	0.0	0.0
Total	699	12	711	XXXX	286	300	586	XXXX	201,047	135,862	336,908	398,776	269,482	668,258	XXXX	XXXX

Delta Smelt Incidental Take Levels

Below Normal Water Year Type

Delta smelt risk assessment matrix (DSRM) Adult level of concern = 892

Re-consultation level for July = 2,500

EXHIBIT 6

CENTRAL VALLEY OPERATIONS OFFICE

DELTA SMELT AND SPLITTAIL

August-07

Note: Bold numbers are not verified by DFG

DATE	Daily Total SWP	Daily Total CVP	Combined Daily Total	Combined 14-Day Average	Daily Total SWP	Daily Total CVP	Combined Daily Total	Combined 14-Day Average	Pumping Daily Total In CFS Banks	Tracy	Combined	Daily Total In Acre Feet Banks	Tracy	Combined	Delta Smelt Daily Density SWP	CVP
1-Aug-07	**0**	**0**	0	0	**0**	**0**	0	8	6,994	4,413	11,408	13,873	8,754	22,627	0.0	0.0
2-Aug-07	**0**	**0**	0	0	**0**	**12**	12	5	6,988	4,458	11,446	13,861	8,842	22,703	0.0	0.0
3-Aug-07	**0**	**0**	0	0	**0**	**0**	0	5	6,992	4,459	11,450	13,868	8,844	22,712	0.0	0.0
4-Aug-07	**0**	**0**	0	0	**3**	**0**	3	4	6,994	4,452	11,445	13,872	8,830	22,702	0.0	0.0
5-Aug-07	**0**	**0**	0	0	**12**	**0**	12	5	7,029	4,459	11,489	13,943	8,845	22,788	0.0	0.0
6-Aug-07	**0**	**0**	0	0	**0**	**0**	0	5	6,791	4,385	11,176	13,470	8,697	22,167	0.0	0.0
7-Aug-07	**0**	**0**	0	0	**0**	**0**	0	4	6,965	4,372	11,337	13,815	8,672	22,487	0.0	0.0
8-Aug-07	**0**	**0**	0	0	**0**	**0**	0	4	7,082	4,434	11,516	14,047	8,794	22,841	0.0	0.0
9-Aug-07	**0**	**0**	0	0	**3**	**0**	3	5	6,971	4,461	11,432	13,826	8,849	22,675	0.0	0.0
10-Aug-07	**0**	**0**	0	0	**3**	**0**	3	5	7,301	4,444	11,745	14,482	8,814	23,296	0.0	0.0
11-Aug-07	**0**	**0**	0	0	**12**	**0**	12	5	5,575	4,430	10,005	11,058	8,787	19,845	0.0	0.0
12-Aug-07	**0**	**0**	0	0	**0**	**0**	0	5	7,864	4,423	12,288	15,599	8,774	24,373	0.0	0.0
13-Aug-07			0	0			0	4	0	0	0			0	#DIV/0!	#DIV/0!
14-Aug-07			0	0			0	3	0	0	0			0	#DIV/0!	#DIV/0!
15-Aug-07			0	0			0	3	0	0	0			0	#DIV/0!	#DIV/0!
16-Aug-07			0	0			0	2	0	0	0			0	#DIV/0!	#DIV/0!
17-Aug-07			0	0			0	2	0	0	0			0	#DIV/0!	#DIV/0!
18-Aug-07			0	0			0	2	0	0	0			0	#DIV/0!	#DIV/0!
19-Aug-07			0	0			0	1	0	0	0			0	#DIV/0!	#DIV/0!
20-Aug-07			0	0			0	1	0	0	0			0	#DIV/0!	#DIV/0!
21-Aug-07			0	0			0	1	0	0	0			0	#DIV/0!	#DIV/0!
22-Aug-07			0	0			0	1	0	0	0			0	#DIV/0!	#DIV/0!
23-Aug-07			0	0			0	1	0	0	0			0	#DIV/0!	#DIV/0!
24-Aug-07			0	0			0	1	0	0	0			0	#DIV/0!	#DIV/0!
25-Aug-07			0	0			0	0	0	0	0			0	#DIV/0!	#DIV/0!
26-Aug-07			0	0			0	0	0	0	0			0	#DIV/0!	#DIV/0!
27-Aug-07			0	0			0	0	0	0	0			0	#DIV/0!	#DIV/0!
28-Aug-07			0	0			0	0	0	0	0			0	#DIV/0!	#DIV/0!
29-Aug-07			0	0			0	0	0	0	0			0	#DIV/0!	#DIV/0!
30-Aug-07			0	0			0	0	0	0	0			0	#DIV/0!	#DIV/0!
31-Aug-07			0	0			0	0	0	0	0			0	#DIV/0!	#DIV/0!
Total	0	0	0	XXXX	33	12	45	XXXX	83,546	53,190	136,736	165,714	105,502	271,216	XXXX	XXXX

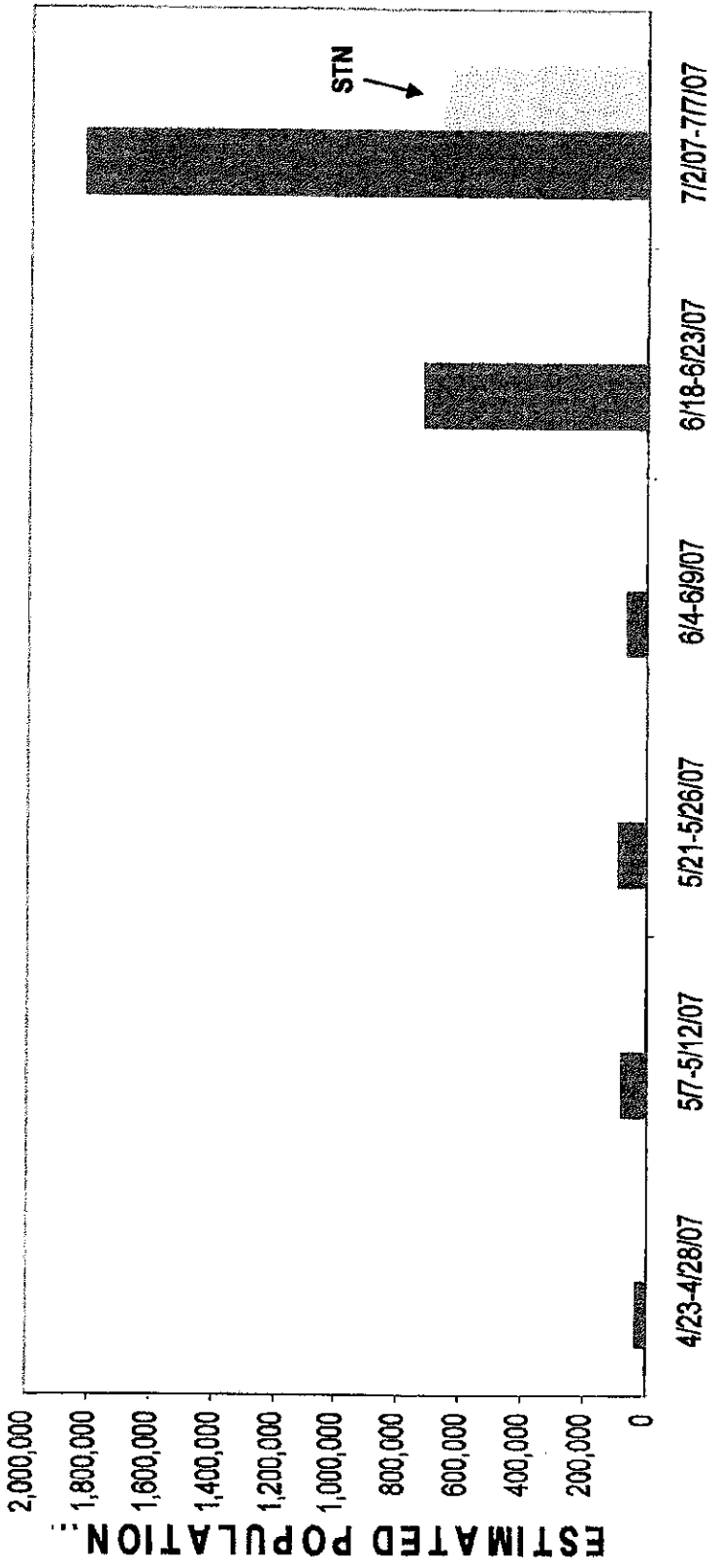
Delta Smelt Incidental Take Levels

Below Normal Water Year Type

Delta smelt risk assessment matrix (DSRM) Adult level of concern = 892

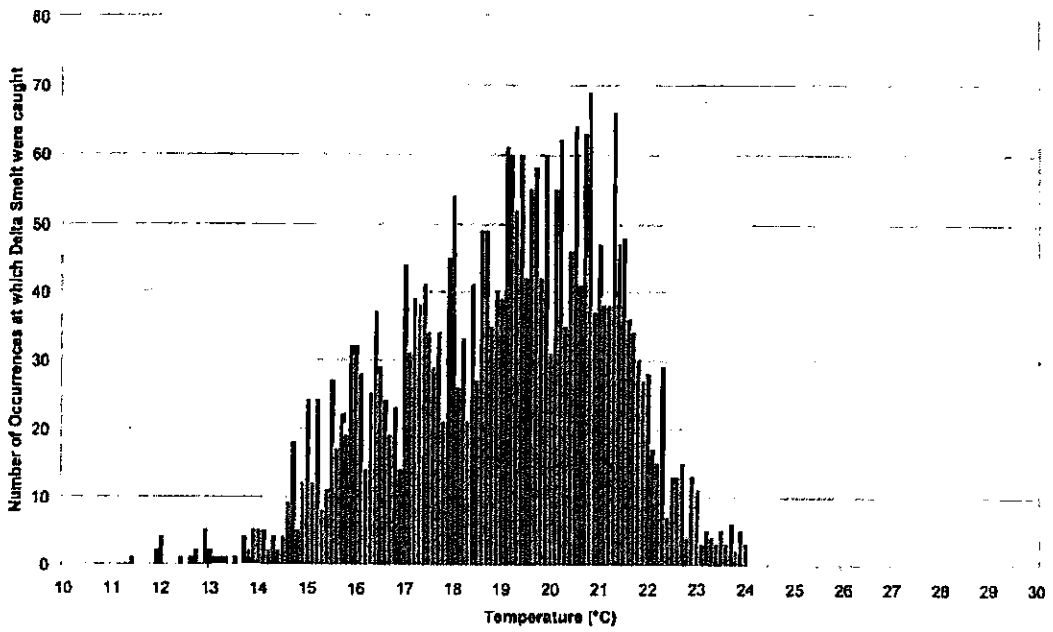
Re-consultation level for August = 100

EXHIBIT 7

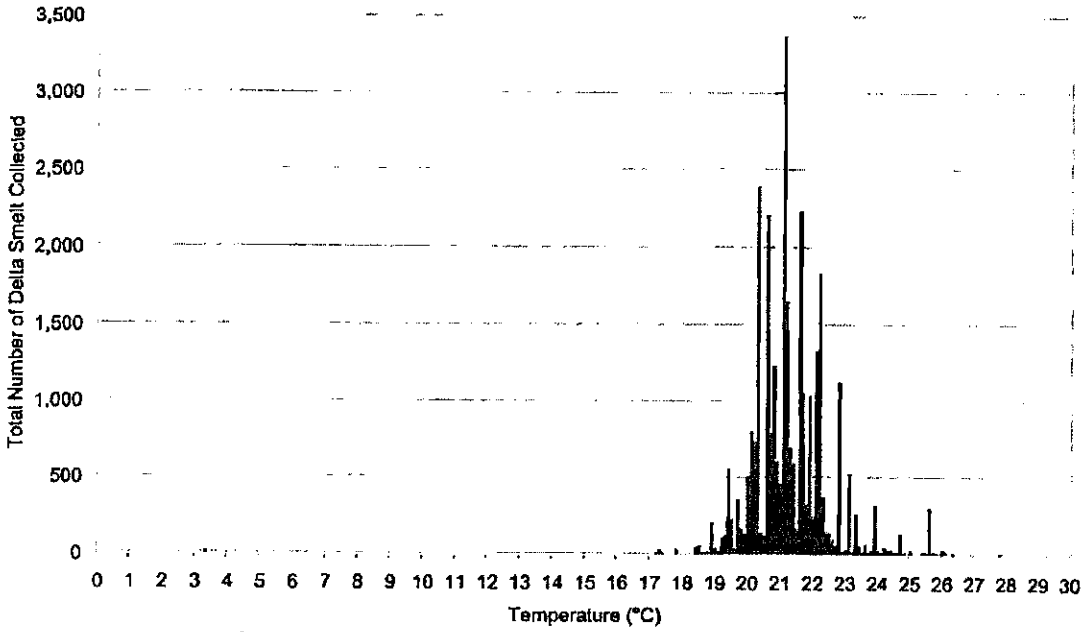


* STN = Summer townet survey, which occurred 7/9-7/14/07.

Exhibit 8



Number of occurrences that delta smelt were present at each sampled temperature during the 20 mm survey, 1995-2005.



Number of occurrences that delta smelt were present at each sampled temperature during the summer townet survey, 1973-2005.

Exhibit 9

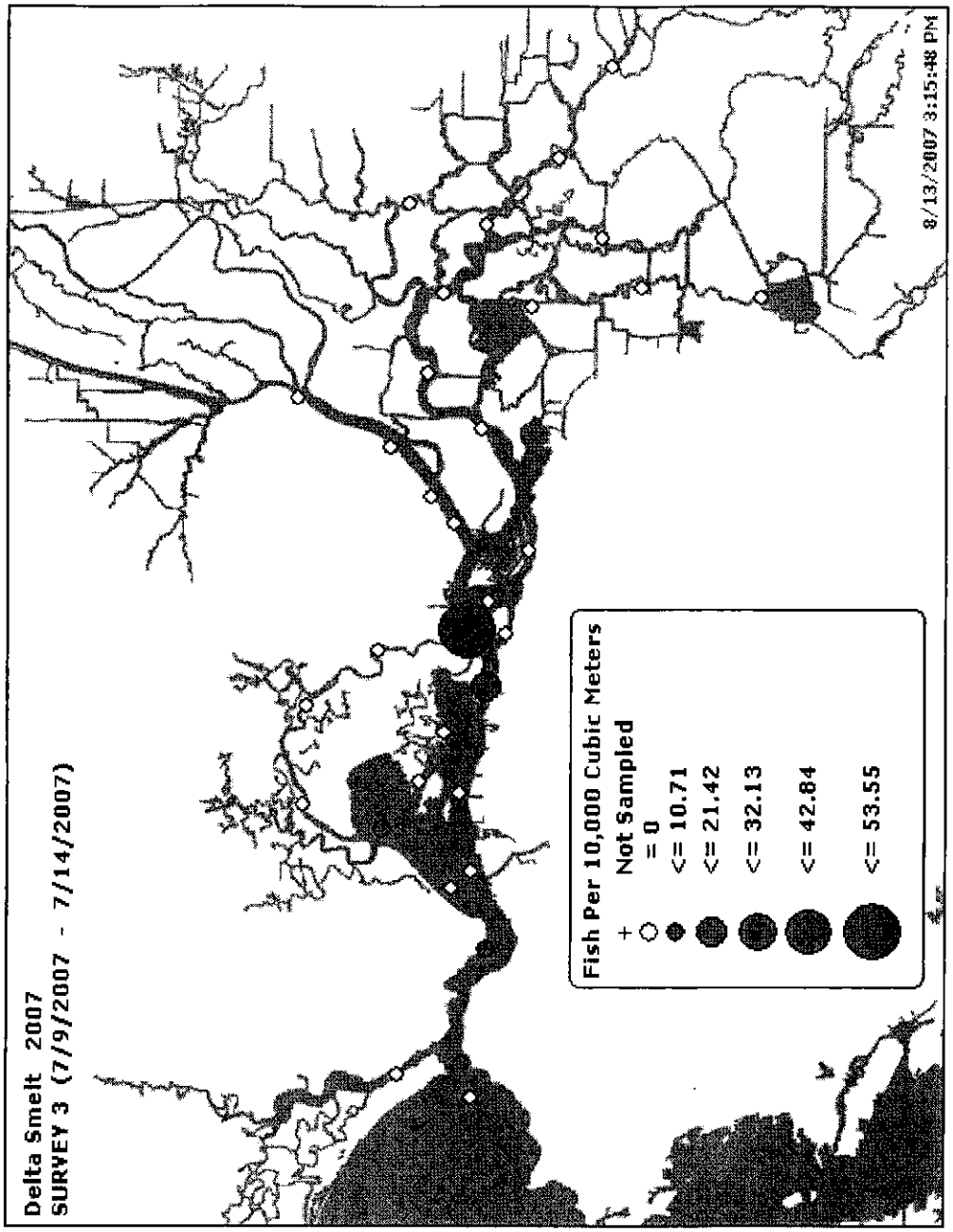

Delta Smelt 2007
SURVEY 3 (7/9/2007 - 7/14/2007)
Fish Per 10,000 Cubic Meters
Not Sampled
= 0
<= 10.71
<= 21.42
<= 32.13
<= 42.84
<= 53.55
8/13/2007 3:15:48 PM

EXHIBIT 10

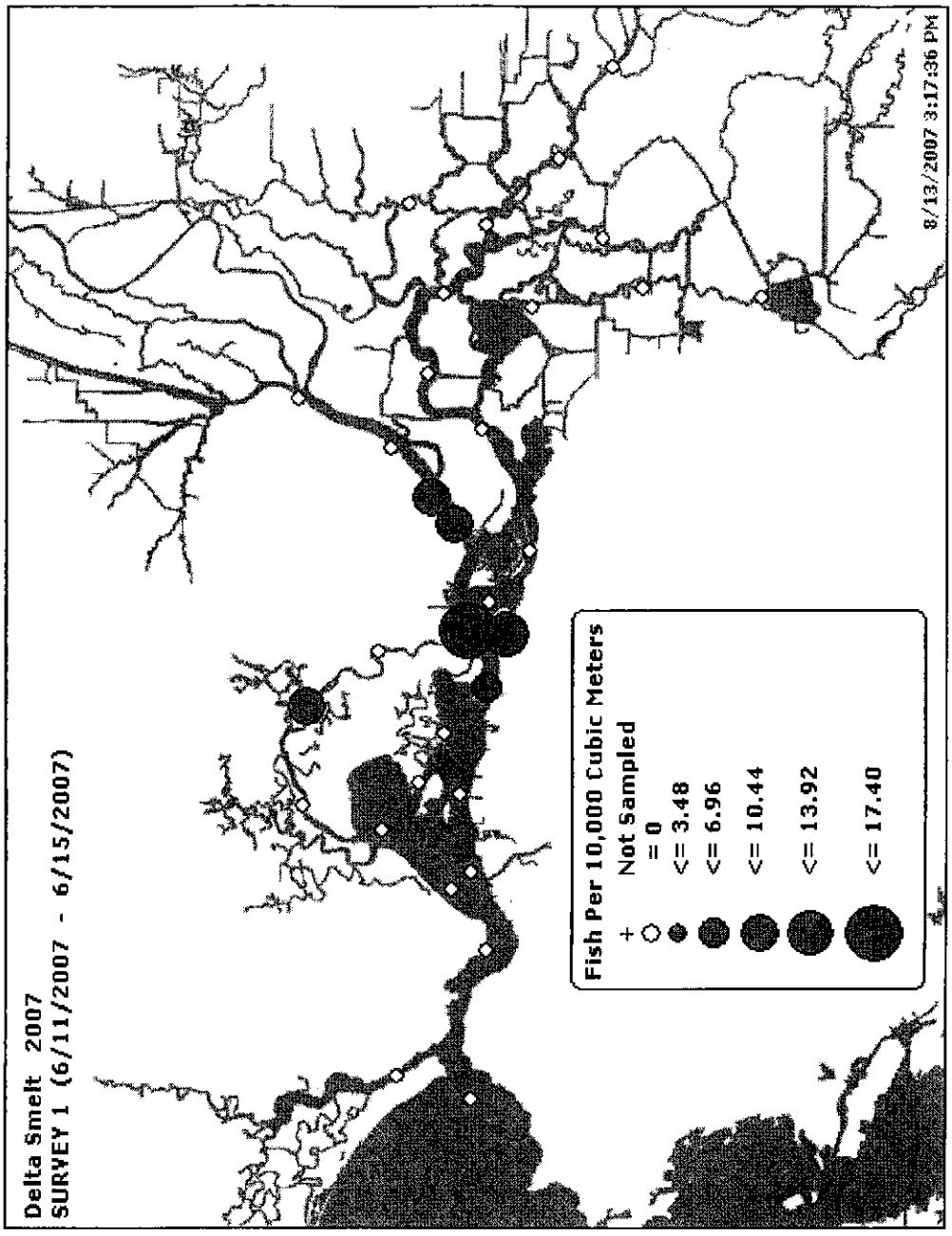

Delta Smelt 2007
SURVEY 1 (6/11/2007 - 6/15/2007)
8/13/2007 3:17:36 PM
Fish Per 10,000 Cubic Meters
Not Sampled
= 0
<= 3.48
<= 6.96
<= 10.44
<= 13.92
<= 17.40

EXHIBIT 11

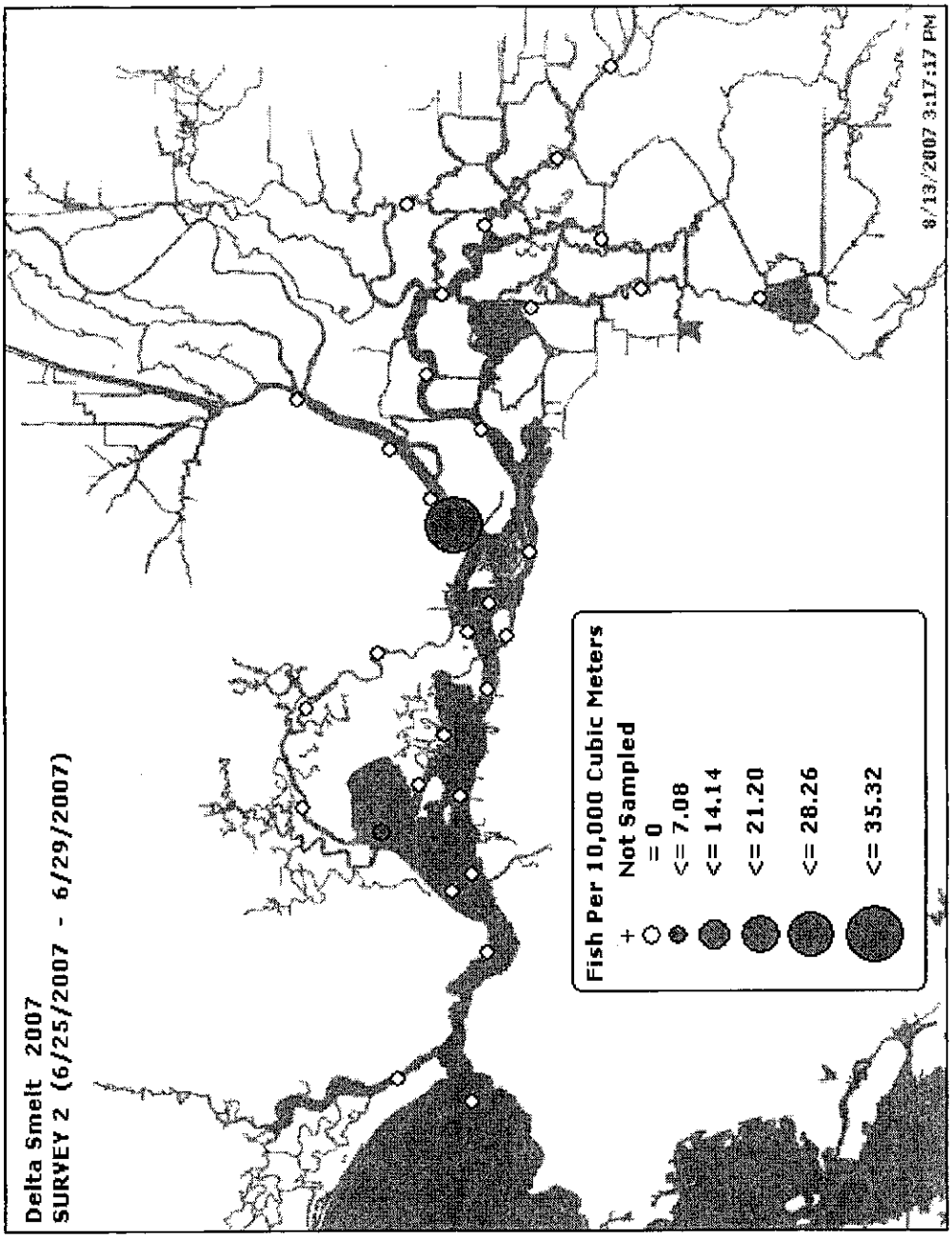

Delta Smelt 2007
SURVEY 2 (6/25/2007 - 6/29/2007)
Fish Per 10,000 Cubic Meters
Not Sampled
= 0
<= 7.08
<= 14.14
<= 21.20
<= 28.26
<= 35.32
8/13/2007 3:17:17 PM

EXHIBIT 12